

Planetary Heat-Flux Sensor for Venus

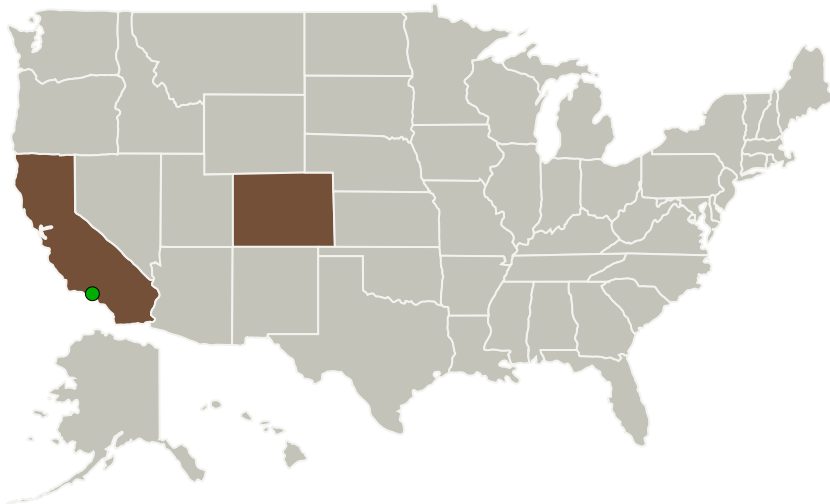
Completed Technology Project (2015 - 2018)



Project Introduction

This proposal seeks to develop an instrument that will help illuminate the evolutionary path that has brought Venus to its unique state today by measuring the heat loss from its surface. Knowledge of the heat loss provides an estimate of the lithospheric thickness, the current level of geologic activity, and distinguishes between various hypotheses of planetary evolution. Our objective is to develop a rapid and robust instrument for measuring heat flow through the Venus surface over the range of 10 to 100+ mW/m² with an accuracy of ± 5 mW/m². We propose to measure heat flow by developing a sensor using 100 pairs of n- and p-type thermoelectric elements. This sensor array creates a thermal resistance to heat flow and the resulting temperature gradient across the sensor generates a voltage that is proportional to heat flux through the sensor. The sensor contacts the Venus surface using a carbon fiber interface pad that is 1 cm thick. The pad is thermally conductive and easily conforms to irregular surface features. Prototypes of the sensor with a single pair of thermoelectric elements and of the interface pad have been built and tested in a PIDDP funded program to demonstrate the feasibility of the measurement concept. This proposal seeks to advance the sensor development by using materials that are compatible with the Venus environment and to measure the heat flux with a sensitivity of 5 mW/m² over the range indicated above.

Primary U.S. Work Locations and Key Partners



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Organizational Responsibility

Responsible Mission Directorate:

Science Mission Directorate (SMD)

Responsible Program:

Planetary Instrument Concepts for the Advancement of Solar System Observations

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| Organizations Performing Work | Role | Type | Location |
|----------------------------------|-------------------------|-------------|----------------------|
| ● Jet Propulsion Laboratory(JPL) | Supporting Organization | NASA Center | Pasadena, California |

| Primary U.S. Work Locations | |
|-----------------------------|----------|
| California | Colorado |

Project Management

Program Director:

Carolyn R Mercer

Program Manager:

Haris Riris

Principal Investigator:

Michael T Pauken

Co-Investigators:

Paul Morgan
Jean P Fleurial
Karen R Piggee
Suzanne E Smrekar

Technology Areas

Primary:

- TX08 Sensors and Instruments
 - └ TX08.3 In-Situ Instruments and Sensors
 - └ TX08.3.6 Extreme Environments Related to Critical System Health Management

Target Destination

Others Inside the Solar System